# SOCIETY MEETING OF OCTOBER 26, 1994

## BIOGEOGRAPHY AND STRUCTURE OF BACKSWIMMER COMMUNITIES IN NORTH AMERICA (HEMIPTERA: NOTONECTIDAE)

**Dr. Eric Larsen**
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How are aquatic insect communities assembled through evolutionary time? What factors determine whether an insect selects a habitat and remains there? Can we predict community composition from an examination of a pool's locality, size, vertebrate predators and amount of "disturbance"? These and other questions are at the core of Dr. Eric Larsen's research on notonectid assemblages in pools in the Southwest U.S. and Mexico and formed the focus of his talk at the first meeting of the Society's 1994-1995 schedule, held at the University of Delaware. Although now teaching in Pennsylvania, Dr. Larsen has had a long association with the West, starting with his youth spent in Wichita, Kansas and completing a Ph.D. at the University of Arizona.

Notonectids, or backswimmers, in the West are primarily still water inhabitants in ponds, pools and stock tanks, and include species principally in two genera, the larger bodied *Notonecta* (11-12mm) and the smaller *Buenoa* (5-8 mm). The differences in the genera also extend to behavior. *Notonecta* species occur primarily at the water surface or on vegetation, feed on terrestrial insects caught on the surface film, and can give a strong bite with their barbed beak. Often *Notonecta* species are highly colored with red, orange and black. *Buenoa* species show neutral buoyancy which allows them to maintain their position anywhere in the water column, and consequently to effectively feed away from the water surface. *Buenoa* species have the first two pairs of legs modified to form a "basket" to grab and hold prey, which often consists of mosquito larvae. Male notonectids can produce sound through two mechanisms: a chirping sound is produced by scraping a tibial comb across striated plates located on the rostral prong on the head, or the femur has a stridulatory area which scrapes against a coxal peg.

Dr. Larsen introduced the audience to the two main pond habitats and their notonectid inhabitants in the Sonoran Desert area where he conducts his research. The mountain canyons contain rock pools called *tinajas* formed by natural scouring by intense, local summer storms, and the surrounding lowlands contain muddy ponds, mostly derived from damming of watercourses by settlers in the last hundred years. (Surprisingly, these lowland ponds are better habitat for notonectids if cattle are present!) Artificial stock tanks can be found in both mountains and valleys. The tinajas harbor 4 species of backswimmers, including a Southwest endemic in each genus, while the lowland ponds contain five species distributed among both genera, none of these Southwest endemics. Assemblages of these species are not random with respect to body size in the Southwest as species of similar body size are far less likely to co-occur in the same pool than one would expect by chance. Body-size mediated competition is the leading hypothesis to explain the pattern. Because backswimmers disperse from one habitat to another by flying, Dr. Larsen was interested in why the species found in tinajas were rarely found in lowland ponds and vice versa. To test criteria of habitat selection, Dr. Larsen used concrete stock tanks of different sizes in both mountain and valley habitats, and found that tinaja species select any size tank as long as it is in the mountains (topographic criteria), while lowland species tend to select the largest size tank no matter where it is located (size criteria). Simply put, choosing the largest size habitat for lowland species decreases the risk of the pond drying out during the two annual drought periods, while selecting a pool based on topography insures a species ends up in a tinaja habitat for which it was evolved specifically to exploit. Dr. Larsen demonstrated that habitat selection is far more complex, though; he observed in Organ Pipe National Monument a tinaja pool with approximately 50,000 individuals (with a continuous "rain" of backswimmers dropping from the sky at the rate

of about 30/minute) yet surrounding tinaja pools had very low populations!

There were several entomological observations presented at the meeting. Susan Whitney recently returned from Puerto Rico and displayed photographs of termite nests in trees. She also discussed the search for termites for a mark-recapture study to be carried out in Newark, and the finding of an excellent colony for study – unfortunately inhabiting one of the University of Delaware's farmhouses! Roger Fuester noted that the flying females of the Asian Gypsy Moth (flight capable female biotype of *Lymantria dispar*) have been collected in the Wilmington N.C. and Long Island, N.Y. areas, probably introduced from pupae on munitions crates from Germany. He noted the concern that this strain readily disperses due to the flying female stage, but that hybridization between the strain established here and the Asian strain is not successful. Jon Gelhaus reported on crane fly collections made in salt marshes along the Delaware Bay in Cumberland Co. New Jersey. He found three crane fly species common, with two of these newly recorded for the state, and one species, *Limonia gibsoni* Alexander, apparently the most common large insect in this habitat in October and its use as food by swallows and possibly other migrant birds. Approximately 20 members and guests were present.

Jon Gelhaus,
Corresponding Secretary

## SOCIETY MEETING OF NOVEMBER 16, 1994

### THE ECOLOGY OF DIABROTICITE CUCUMBER BEETLE PHARMACOPHAGY (COLEOPTERA: CHRYSOMELIDAE)

**Dr. Douglas W. Tallamy**
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Cucurbitacins, a class of chemicals found mostly in cucurbit plants such as native gourd species, are some of the most bitter compounds known, even at levels of 1 part per billion. These chemicals are toxic to mammals, causing vomiting and even shrinking tumors, and act as feeding deterrents against insects. Yet, for cucumber beetles, cucurbitacins are strong attractants for both adults and larvae, and individuals will feed on pure cucurbitacins even when it decreases their life span and fecundity! The complexities of this attraction and the various hypotheses to explain the origin of it form the core of Doug Tallamy's research, and he discussed the topic during this Philadelphia meeting of the Society.

Pharmacophagy, the acquisition of a chemical for use other than primary metabolism or recognition of host plants, is well illustrated by *Diabrotica* cucumber beetles. These insects comprise some of our most important agricultural pests including grass specialists (particularly pests of corn) like the Western and Northern Corn Rootworms, pests of cucurbits like the Striped Cucumber Beetle and those with broader host ranges like the Banded and Spotted Cucumber Beetles. All are stimulated to feed by the non-volatile cucurbitacins, even at low concentrations of 1 nanogram/milliliter. The beetles most easily pick up the compounds as adults when feeding on cucurbit pollen. They are easily satiated though, and excrete much of it, detoxifying only a small amount in their haemolymph and cuticle to give them a bitter taste. This feeding comes at a cost for some species, either in reduction of life span or fecundity, and also requires the grass specialists to leave their hosts to seek the compounds. For the Spotted Cucumber Beetle, though, there is little measurable cost in fitness by feeding on and using the cucurbitacins.

Dr. Tallamy discussed competing hypotheses explaining the reasons for this attraction in spite of its cost on fitness. The null hypothesis considers the system of no adaptive advantage, sim-